

Claims

1. A method of determining the contour of a substantially flat workpiece (20, 30, 50), comprising:

applying one or more reference markers to the workpiece

5 (20, 30, 50);

obtaining at least two overlapping digital photographs (35, 55a-d) of the workpiece (20, 30, 50) from different perspectives;

photogrammetrically processing the photographs (35, 55a-  
10 d) to produce a true-to-scale overall image (56) of the workpiece (20, 30, 50); and

determining the contour of the workpiece (20, 30, 50) from the true-to-scale overall image (56).

15 2. The method according to claim 1, wherein said step of applying the reference markers comprises the step of applying a plurality of length scales (43) distributed over a surface of the workpiece.

20 3. The method according to claim 1, wherein said step of applying the reference markers comprises the step of applying a plurality of position-markers (41, 51) distributed over a surface of the workpiece.

25 4. The method according to claim 1, wherein the workpieces (20, 30, 50) are sheet metal parts of an automobile.

5. The method according to claim 1, further comprising:

30 using a workpiece support in cooperation with the workpiece; and

applying the reference markers to the workpiece support.

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6. The method according to claim 5, wherein the reference markers are plurality of length scales (43) or position-markers (41, 51) distributed over a surface of the  
5 workpiece.

7. The method according to claim 5, wherein the workpiece support is dark in color in comparison with the workpiece (20, 30, 50).

10 8. The method according to claim 1, further comprising the step of applying a contrasting coating to the workpiece (20, 30, 50).

15 9. The method according to claim 1, wherein said step of applying the reference markers comprises the step of arranging the reference markers on an equalizing layer of the workpiece (20, 30, 50).

20 10. The method according to claim 1, wherein said step of obtaining the overlapping digital photographs (35, 55a-d) comprises the steps of:

using a digital camera to record the overlapping digital photographs (35, 55a-d), the digital camera having ; and

25 recording the overlapping digital photographs (35, 55a-d) from perspectives with substantially mutually perpendicularly disposed optical axes of the digital camera (21).

30 11. The method according to claim 1, further comprising the step of rectifying each of the overlapping digital photographs (35, 55a-d) such that image planes of the photographs and workpiece are transformed onto each other.

12. The method according to claim 1, wherein the contour of the workpiece (20, 30, 50) is a polygon.

13. A method of establishing a form die for cutting  
5 sheet metal parts, comprising:

producing a prototype of the form die;

cutting a test sheet with the prototype form die;

determining the contour of the test sheet in accordance with the method of claim 1;

10 comparing the contour of the test sheet to a reference  
contour; and

adjusting the shape of a subsequent prototype form die based on the comparison of the test sheet contour to the reference contour.

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14. An apparatus for determining the contour of a substantially flat workpiece (20, 30, 50), comprising:

one or more reference markers for application to the workpiece;

20        a digital camera (21) for recording digital, electroni-  
cally stored photographs (35, 55a-d) of the workpiece (20,  
30, 50); and

a data processing unit for photogrammetrically processing the stored photographs (35, 55a-d), for producing a true-to-scale overall image (56) of the workpiece (20, 30, 50) therefrom and for determining the contour of the workpiece (20, 30, 50) from the true-to-scale overall image.

15. The apparatus according to claim 14, wherein the  
30 reference markers are position-markers (41, 51).

16. The apparatus according to claim 14, wherein the reference markers are length scales (43).

17. The apparatus according to claim 14, further comprising a workpiece support having the references disposed thereon.